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PROGRESS SCORED IN 1887.

Now that the first half of 1887 has fulfilled its part in the making of history, perhaps a slight glance at the lines which record that history may reveal something of interest to the workers in the gas field. The first and most important query to be answered is that concerning the quantities of gas sent out as compared with the output for the first half of '86. From the best sources of information at our command, and these are perfectly reliable, we are in position to say that the increase in this respect has been little short of marvellous. Perhaps the greatest gain, speaking about the Eastern and middle sections of the country, occurred in New York city, for here the entire resources of the huge plants had to be called upon to meet the demand for light. Of course, the metropolitan conditions were somewhat abnormal, but we nevertheless think, even were ordinary conditions alone prevalent, that the increased traffic in gas would have furnished food for surprise. Boston reports also go to show that the gas makers of the East have had their time fully engaged in answering the demands of their consumers. And so it seems to have been throughout the country. In fact positive proof of the increase is furnished in the wonderful activity that now prevails in every direction. From every quarter and section we have circumstantial accounts of enlargements and betterments now being made to existing plants, which work is being prosecuted simply because of the desire to securely hold the advance of the past and to provide for the drain of the future. This activity bespeaks the confidence of the gas men in the stability of their business, and also vouches for their ability to hold the field against all comers. In the meantime one branch of electric lighting does not seem to have received any great setback. On the contrary much progress appears to have been made by the arc electricians, who, by-the-way, now that they have abated somewhat the extravagance of their original claims, seem to achieve greater success with their nearer approach to truthfulness. Perhaps the electrical promoters of this city see their way clear towards making a profit in supplying arc lights for purposes of public or street illumination at the rate of 25 cents each per night, and to keep them alight on an average of 4,000 hours per annum. Certainly, if they can do so, profitably they are in position to wrest the great bulk of the city's lighting from the gas companies, which might, after all, not be a great loss to the latter, since it would be far cheaper for the gas men (in consideration of the price received per lamp per annum) to forego the lighting of the streets than to institute and perfect huge plant extensions to meet the increasing demands of their ordinary consumers. Although the arc lighting advocates have scored an advance, the exponents of the incandescent system do not seem to have kept pace with their more fortunate brethren. Taking the Edison Central station in the lower part of this city as a guide, we do not believe that its controllers are now in possession of as large a business as they were a twelvemonth ago; but whether so or not the fact remains that the increase in the quantity of gas sent out from the New York station of the Consolidated Gas Light Company—which is the principal source of gas supply in the district operated in by the Edison Company—during the twelvemonth has been little short of phenomenal. While we think that, as at present carried on, gas companies have little to fear from competition with incandescent electric lighting, we are nevertheless inclined to adhere to the view ex-

pressed in our first issue for the current year. That is, we believe good business policy would be subserved were gas companies to embark on the seas of joint supply. Now that several good systems, which permit of the supply of arc and incandescent lamps from the same circuit, are on the market, those gas men who employ such plants are in position to say to their customers, "Pay your money and take your choice, for we can supply you with any or all of three classes of lights." Still, there can be no hard-and-fast rule formulated in this respect which will apply satisfactorily to all places. Circumstance and locality make the necessity, and measures for relief or protection must be determined upon according to the necessity.

With the knowledge that steady and important progress has during the half year attended the main point of interest to the gas maker, and confident in the belief that the living half is to be a repetition of its departed fellow, we may extend our congratulations to the fraternity on the success of their efforts. Our Association gatherings have been fruitful of good work and effective in results; and even though death has been busy in the ranks those who dropped by the way have not taken from us the light of their example. When all is summed up the verdict in regard to the progress so far scored in '87 must be decidedly in favor of advance; and we believe that if tokens count for aught the gas men are pretty well pleased over the outlook for the balance of the year.

OBITUARY—FRANCIS E. HARRISON.

We are compelled to announce the death of Mr. Francis E. Harrison, late Treasurer of the New Haven (Conn.) Gas Light Company, whose demise occurred shortly before midnight of Tuesday, June 21, at his residence, No. 562 Chapel street, New Haven. Deceased, who through his entire business career had been a great worker, about two years ago suffered severely from an attack of nervous prostration, but unhappily he did not heed the warning of nature and continued to overtax his energies, forgetting, seemingly, that a limit is allotted to what any man may accomplish. In consequence of this disregard Mr. Harrison while seated before his office desk last September was stricken with apoplexy, and although his sturdy frame resisted the first blow, his subsequent condition was such as to give his family serious ground for alarm. Their forebodings were well founded, for on the Friday preceding final collapse the family physician notified them that the husband and father neared his end, and death claimed his own on the day above mentioned.

Deceased was born in New Haven, on Nov. 27, 1820, and graduated from Yale College with the class of 1849, President Dwight having been one of his classmates. His first years out of college were spent in teaching, and in preparing himself for the duties of a physician, but his studies in the latter direction were abandoned when he decided to accept a congenial position (the editorship of the Windham County *Telegraph*) that had been offered him. This new field, owing to the way in which he developed it, brought him into political notice, and in 1854 we find him occupying the position of Assistant Clerk to the Connecticut House of Representatives. He became Chief Clerk in the following year. Between 1856 and 1861 he was engaged in the banking business—first with the Elm City Bank, afterwards with the Litchfield Bank. In 1861 he was appointed to the Assistant Postmastership of his native city, remaining in that berth for eight years. In 1870 he was appointed Secretary to the New Haven and Derby Railroad, and to the duties of that position he added (1872) those of the Treasurership of the New Haven Gas Light Company. Beyond a doubt the strain on his mental system occasioned by the demands of such important trusts accounts for his comparatively early demise. Indeed, the wonder is that he withstood the unequal contest for such a length of time. Mr. Harrison was married in 1858, and a widow and five children survive him. In his death New Haven loses a public-spirited citizen, and the New Haven Gas Company a painstaking, trustworthy officer.

The Electric Light and Plants.

Engineering, seemingly betwixt fear and hope in regard to the point discussed, says that the Winter Palace of the Czar at St. Petersbnrg, is on festive occasions illuminated by electric light, and the palms and exotics used in decorating the banqueting and other rooms are believed to suffer from the blaze of light. The leaves turn yellow and dry up, then fall off. The action of the light is thought to be too intense and sudden on them after their transference from the conservatories where they are wintered. The late Dr. Siemens showed that electric light promoted the growth of plants, and it is difficult to understand how even the bright light of the Imperial galleries can have the reverse effect; but so it is reported. The subject is, however, open to further investigation, as there may be other influences at work than the mere illumination. If it should prove to be the latter the suddenness of the change from the dull greenhouses to the brilliant rooms may have to do with the problem, though it is somewhat singular that a similar effect has not been reported from other quarters.

[Official Report.—Continued from Vol. XLVI., page 380.]

Tenth Annual Meeting of the Western Gas Association.

Held at St. Louis, Mo., May 11, 12 and 13, 1887.

First Day—Afternoon Session—May 11.

A PRELIMINARY ATTACK ON THE QUESTION-BOX.

The President called attention to the fact that the hour for adjourning the afternoon session was close at hand, and suggested that, instead of proceeding with the reading of papers, the Question-Box be opened and a portion of its contents be discussed. The suggestion met with approval, whereupon Secretary Littleton unsealed the box and drew the following query therefrom:

"*What is the best way to fight the electric light?*"

The question was thus discussed—

Mr. Scofield—Sell gas so cheaply that the electrical promoters cannot compete with it.

A Member—Take it in.

Mr. King—I think the answer to that question must be governed largely by local circumstances. At Jacksonville (Ills.) we found that the best way to wrestle with it was to take hold of it ourselves, and we are now satisfied that we did the right thing.

Mr. Jenkins—This is one of the very questions that prompted me to visit St. Louis this year. At Columbus, Ga., we deem it a most important matter, and I wish Mr. King would tell those of us who are in doubt about the policy to be pursued how he accomplished success.

Mr. King—In the belief, then, that the Association wishes it, I will give our experience in regard to this matter; but my willingness to speak on the topic may perhaps be open to the charge of being tinged with selfishness, for I can in this way answer scores of letters that I have received. My correspondents have asked so many different questions that to frame separate and proper answers to their queries not only involve much writing but considerable study as well. The chief query from those on the seeming anxious seat has been in respect to the cost of electric light supply, and while I have prepared no paper on the subject, nevertheless, just before leaving home, I took some figures from our books which I will be glad to give. As I said before I believe this question of electric lighting must be decided according to local circumstances, consequently I cannot on this topic decide for another man, nor the latter for me. In our case a separate electric light company that started in Jacksonville made a failure of the attempt, for its proprietors did not receive the support or encouragement they expected to obtain. When they gave up the attempt we bought from them such portions of their plant as we could utilize in the system which we proposed to operate—the Thomson-Houston. Our present plant has a capacity for 63 lights, 25 of which are each rated to give 2,000-candle power, the remaining 38 being of the so-called 1,200-candle power type. In the first year we only supplied the 25 high candle power lights, but on July 1, 1886, we added the other 38 or low candle power variety. We supply the city with 31 lights, which are placed on towers, and are employed in lieu of the oil lights which formerly lighted what was known as the gasoline district. One of these towers, however, is in the center of one of the city squares, and so displaces more or less of the gas lights hitherto burned in that section. Because of the action of the Council we lost one-half of our gas lamps, not for the reason that they were not necessary, but because, during this year, and perhaps for several years to come, our city will be financially short, and shall not have the money to pay for all the lights that are requisite to meet the public lighting needs. Six of the 1,200-candle power lights are used on a tower in the park in the center of the square; the 2,000-candle power lights are located on towers on the outskirts of the city, and the balance of the 1,200-candle power lights are used in the stores of our merchants. We have never been called upon to change one of them—never had one of them given up, and have had very little complaint from them. For the commercial lights on a circuit that we operate until midnight we receive $8 each per month, and for the public lights, which are also cut out at midnight, we receive $100 each per year. In figuring on the cost of the electric light it is very much—and must be so—as it is with the gas business. For instance, Mr. Fullagar can make gas cheaper in Cincinnati than I can at Jacksonville, because the conditions are more favorable with him than with me. It is so in electric lighting. It depends most upon the way your power is generated, and upon the sort and consequent cost of the fuel employed, for I presume the cost of labor is pretty much the same everywhere. It is pretty hard to say where one uses (as I do) the refuse from the gas works for fuel, just what the cost of each light is from month to month. In running this plant I have a boiler 14 feet in length and 5 feet in diameter, with

78 three-inch tubes, set in the ordinary way. I also have a Parsons' blower, which answers my purpose very well. For fuel we use the breeze and screenings resulting from the operation of crushing the coke, and we also screen out the cinders from the retort furnaces. Sometimes we purchase a poor grade of slack that costs about $15 a carload on the track. During the winter time all the extra fuel that I have to buy is one carload per month of this slack. At least that has been the average in the past winter. In the summer time one carload will last me for two months. In the matter of labor, I require two men, an engineer and a trimmer. They take entire charge of the plant. The trimmer collects the bills, keeps the books, in fact takes entire charge of that end of the business, and reports to me every month. So far I have no trouble to collect bills for electric lighting. Indeed I can say that these accounts are paid willingly and promptly. I have no "dead ducks" at all on the list. Now, as to the general results. We have been running for 11 months under the conditions stated, and having properly charged all actual expenses against the electric light department of our business, or so that everything which we ordered has been paid for, with a plentiful stock of carbons, oil, and other incidentals on hand, up to the first of this month, the profit figures out at $2,549.71. The plant cost us $17,346.20. In using the words "all actual expenses," I do not wish to be understood as saying that I have charged anything for rent, value of coke breeze used, superintendence, or for anything of that kind. The electric branch simply shows a profit of that much, under the circumstances named for the 11 months. These are the facts. The charge for superintendence is something which you must adjust for yourselves, for I never found two men who thought just alike as to what should be charged on account of that item. Now, with regard to the effect or influence of the electric light on our sales of gas. Since we have commenced to supply electric light our sales of gas have been larger than ever before. We have increased our gas sales seven per cent. during the last year, although we can account in a measure for a part of it. Having lost one-half of our lamp posts our sendout was diminished in that respect; but, on the other hand, an addition made to one of the State buildings devoted to public purposes more than compensated for our loss on public lamps, although the increase did not explain or account for all the seven per cent. increase mentioned. Our principal hotel keeper uses four arc lights—one each, on the outside, in the office, in the billiard and dining rooms. He pays a total of $25 per month for these four lights, and his gas bill for the last year was 50 per cent. larger than it ever had been before. He overhauled and improved the hotel considerably, and I think probably put in new fixtures and burners, which improvements may account for much of the increase in the quantity of the gas burned by him.

Mr. Howard—Were you to put in eight electric lights perhaps his consumption of gas would be still larger.

Mr. Page—What do you charge for gas?

Mr. King—Two dollars per thousand.

Mr. Cosgrove—What system of electric lighting do you use?

Mr. King—The Thomson-Houston. These are facts in connection with my experience in electric lighting. I do not pretend to say they will apply in all cases, or that it is advisable for all gas men to put in electric light plants. Our directors, however, are quite satisfied with the Jacksonville showing.

Mr. Lansden—Others had been in the electric lighting business in your city before the Gas Company took hold of it?

Mr. King—Yes; but they failed in their attempt.

Mr. Lansden—Then the people were accustomed to the use of the electric light before you took hold of it?

Mr. King—Yes.

Mr. Lansden—Did you allow anything for wear and tear of machinery?

Mr. King—No; we keep that up out of the receipts. The apparatus now is apparently in as good condition as when we put it in.

Mr. Page—I would like to state it is admitted by electric light people that the wear and tear of their apparatus ranges from 15 to 20 per cent., therefore if that percentage is added to the $17,000 some of the profit will pass away.

Mr. King—I think it is a question whether the wear and tear account will go as high as that stated by Mr. Page. So far as we are concerned whether we have made a dollar out of the electric light or not, we are satisfied with the result, because we control the field. I do not care who comes there now, for we not only have the inside track of the entire lighting business, but the new policy instead of diminishing our sales of gas has actually increased our sendout. We are satisfied that we did the right thing in putting in the electric light, even if, at the end of 10 or 15 years, it has been shown that we did not make a dollar out of it, for at any rate we will have at least paid for the plant out of its earnings. A brother gas engineer in writing to me, some time ago, said, "We have an electric lighting plant here. Already some of the consumers are disgusted with it, and wish to come back to gas, but they have signed a contract, which binds them for a year, and I cannot get hold of that contract to see what it is like. I take it for granted that the printed forms of electric lighting contracts of the sort noted are pretty much the same, and if you have an extra form of contract to spare I wish you would send me one." I wrote in reply that contracts were something we did not pay any attention to—if a man said he wanted the light we put it in—because if he did not care to take the electric light we supplied him with gas; again, if he did not care to take the gas, he had to come to us for the electric light. In acknowledging my reply the inquirer answered that probably if the conditions were different we would think more of a contract, which is, perhaps, true. That is one instance of many which I might cite.

Mr. Watts—You said you got $100 for each arc supplied to the city.

Mr. King—Yes; we get the same price for the 1,200-candle power lights that we do for the 2,000.

Mr. Harbison—On how many nights per month are they burned?

Mr. King—About 17 nights per month, and until 12 o'clock, only.

Mr. Scofield—Do the gas lamps burn later than 12 o'clock?

Mr. King—No.

Mr. Jenkins—The question was raised as to charging for superintendence and breeze. I understand you have not charged for either because there was no additional expense incurred by the Gas Company under these heads.

Mr. King—No charge was made for these items simply because the breeze that is now consumed was formerly thrown away, and no extra expense has been caused for superintendence.

Mr. Boardman—What was the feeling in the community when they discovered that the "bloated gas monopolists" had secured control of the electric light plant?

Mr. King—There was no trouble about it at all. In fact we were congratulated on having taken hold of it, because the people felt that it would be run as it should be, and they had been dissatisfied with the way in which the originators performed the work. We lowered the price per light at once. The former company charged $12 per month for each light, whereas we promised to supply them at $8. This step caused great satisfaction to our residents.

Mr. Watts—Do you think you are making anything on your commercial lights?

Mr. King—I have not figured it out; it is a matter that I have not gone into in great detail. I intended to go into a very careful test, and had arranged to have cards prepared every month showing the amount of power used, the number of carbons burned, etc., in order to be able to state everything exactly; but circumstances have been such that I could not do it. Eventually I will carry out that idea, and then I can tell just what can be relatively done with 1,200 and 2,000-candle power lights. Of course, any experiment of this nature, to be satisfactory, would involve a good deal of expense. Our directors having been satisfied with the showing for the year, which showing is so far ahead of what we had expected, accounts somewhat for my delay in instituting the more minute experiments which I would like to make.

Mr. Harbison—What is the difference that the city now pays for the electric light as compared with the gas lights that the former displaced?

Mr. King—The city now pays $2,500 less per annum than was the case before. We are furnishing the city with all the light used. It is as well lighted as it was before, and pays nearly $2,500 less for the service rendered. The gasoline was furnished by the city itself. You will remember that some of these electric lights are in the district formerly lighted by gasoline.

Mr. Harbison—What difference is there in the cost to the city for the electric lights, as compared with the gas lights displaced in that portion of the city lighted, leaving the gasoline district out of the question? Is the city paying more or less for light in those districts where you formerly supplied gas?

Mr. King—The lighting of the whole city is accomplished at $2,500 less than any yearly sum ever paid before. They have not had the money with which to contract for all the lights they want, or that we would like to give them; and consequently only those portions of the city in which public lighting is an absolute necessity are at present illuminated.

Mr. McMillin—I would like to ask Mr. King if his conscience was perfectly easy about the price his Company was charging the city for gas before the electric light was tried.

Mr. King—$17.50 per post is all that we have had for the last 6 or 8 years.

Mr. Harbison—The number of nights in the month that the lights are

burning is comparatively few when compared with the practice followed in other cities.

Mr. King—If you take the Philadelphia standard you will not find such a very great difference in the hours.

Mr. Watts—How many gas lamps have been displaced by one electric lamp?

Mr. King—That would be pretty hard to tell, because the electric lights chiefly displaced gasoline posts. In fact, the only one intended to displace any gas posts was the tower in the center of the square.

Mr. Averill—How many did that displace?

Mr. King—I do not remember exactly, but more than I wish it had, and more than we expected it would. A great difference of opinion exists about the value of tower lighting, and my mind is not fully made up on the subject. In some places tower lighting is unquestionably the best, while in other places pole lighting is superior. Perhaps we have accomplished with the tower what we could not have done with three or four times as many pole lights. The electrician who located our lights (he had performed a similar duty in many other cities) could not devise any better plan that would come within our means for lighting our city. Jacksonville's surface is flat, is very greatly scattered, and possesses a great many trees—in many places the trees form an arch over the street. It would be impossible to light some parts of the city at all because of the trees.

Mr. Jenkins—In our place we have a great many shade trees, and I do not think we could light up with the electric light unless we put a light at the corner of each block. We put only two lamp posts to a block in the thickest part of the city. How many lamp posts would that one electric lamp displace in the district where you use gas?

Mr. King—I cannot answer that question now.

Mr. Jenkins—According to your figures you can displace seven gas posts.

Mr. King—It depends upon how many gas posts you have in a given radius. You have two lamps in every 700 feet, while in Quincy, Ill., the gas posts are only 120 feet apart. It is hard to tell, unless the conditions are similar, just how many gas lamps an electric light will displace. In our place the gas posts are pretty far apart.

Mr. Jenkins—Do you think one arc would displace more than three or four gas posts?

Mr. King—It depends so much upon the shade and the buildings that I cannot answer you.

Mr. Harbison—I think Mr. King could answer that question very satisfactorily if he would state what, in his opinion, is the distance from one electric light pole that the light will radiate; whether he thinks it would radiate more than 150 feet in either direction. That would give the information desired on this subject. Whether or not, on this 700-ft. block, he thinks it would not be necessary to put one post at each end, and one in the center, in order to properly light the street. I think he will say "yes" to that question, if he answers as he believes it; but I do not want to answer the question for him.

Mr. King—Those who have paid attention to the matter know atmospheric conditions have a great deal to do with lighting availability of the electric light. Even when lights are so far apart that you may say you do not really see any effect from them, if they go out you will note a very great difference in the general appearance. Under the latter condition you cannot see nearly as far as you could when the lights (even though they appeared to be valueless as illuminators) were in duty. My residence is not quite half a mile from an electric light tower, but on almost any fine night I can step outside my door and read the time from my watch. On a foggy night I might not do it. The tower in the square carries five arcs, and although a gas lamp, burning four feet of gas per hour, is located right at the corner of my yard, on some nights I can get a shadow from the electric light toward the lamp post.

Mr. Harbison—In the one case you may look for a 10,000-candle power light, while in the other the light will not exceed 16 or 17 candles.

Mr. King—But one is nearly half a mile away. On cloudy nights I have noticed, from the reflection, that they light our town up immensely. A man came to me the other night and said he thought the whole town was on fire—a thunder storm was coming on and the clouds reflected the light. He is three-quarters of a mile from the tower, but could not make up his mind what was the matter, for everything was illuminated. That night the tower shone out beautifully, and nobody could ask for a better illumination. With regard to the satisfaction given by the towers, I can say that, on the whole, the people are better pleased with the light coming from the elevated arcs than they ever were by the lighting system formerly followed in the same districts. Of course some object to the towers. A man whose house cuts off the light from a tower so that the rays do not reach his front yard will complain. We have had some complaint in that respect, but I think our people will bear me out in saying they have never before made so little complaint about the lighting as that offered this last year. They are also paying $2,500 per annum less for the service.

Mr. Murdock—If I understand, you have five towers there.

Mr. King—Six altogether—five of 2,000 and one of 1,200-candle power.

Mr. Scofield—What is the difference between the 1,200 and the 2,000 candle power light? Is there a real difference of 800 candles in the lights?

Mr. King—Probably you know as much or more about that than I do, for I have never been able to make the test.

Mr. Boardman—What do you get for your commercial lights?

Mr. King—We get $8 per month for a single light; those who use two lights get them for $15; those who take four get them for $25.

Mr. Boardman—Have you had occasion to place one of your 1,200-candle power lights in a position where one of 2,000-candle power had been used? If so, was there any difference noticed?

Mr. King—We have done that. At first we ran our 2,000-candle power light dynamo right on to the commercial circuit. When we put in the 1,200-candle power light probably four or five noticed the change by remarking they did not get quite so bright a light. They made no serious objection, however. I have often heard it said one could not detect the difference in the lights, and I believe that to be so. I think I could show you, in several instances, one light and then the other, and that if you had not seen them close together you could not tell the difference. I have replaced a high-power Siemens burner with an arc light, and the party who ordered the substitution was greatly pleased with the result.

Mr. Diall—How many dynamos have you used, and how long have you had them?

Mr. King—One has been running for two years, and it is working today as well as when put in. There is no noticeable wear, tear, or depreciation about it.

Mr. Howard—How high are the towers?

Mr. King—125 feet.

Mr. Graeff—Was the displacement of that Siemens lamp approved by the party simply because it was a matter of convenience? What opinion did he express with regard to the light?

Mr. King—In that case (it was a 50-ft. Siemens) the arc light was cheaper.

Mr. Graeff—I asked the question because I have tried, on more than one occasion, the experiment of placing a large Siemens burner (rated to a duty of 2,000 candles) in comparison with a 2,000 candle power arc light, and found that the Siemens would throw a shadow pretty close up to that of the arc. During the last year they have taken all the electric arcs out of our public squares in Philadelphia, Pa., and replaced them with Siemens burners.

Mr. King—The chief objection that my customer had to the Siemens burner was the care and responsibility of feeling that he had to look after it in order to save gas. He felt that if he did not look after it closely he would have to pay a very large gas bill at the end of the month, and was willing to pay something for the sake of being relieved from that anxiety.

Mr. Harbison—If you agreed to furnish him gas to that burner at so much per year, or as you did with the arc light, the "anxiety objection" would have been removed.

Mr. King—It would have been very different then.

Mr. Harbison—Then he would not have made the change?

Mr. King—He might not.

Mr. Cosgrove—At $1 per thousand, how long would you keep the electric light plant running?

Mr. King—Even under that condition of gas prices I think we would run the electric light there just as we are now doing.

Mr. Scofield—Mr. King is, no doubt, a very popular man in his town. Indeed, I am satisfied of it from reports I have had from those who have visited him. I know that he is also on the right side of his City Council. The fact is that he handles the thing about in his own way. He has a good thing in it, but he has yet to make a showing here of the true profit involved in running an electric lighting plant. The question with us is this: Whether the gas fraternity should adopt the electric light, not for the dollars and cents that can be made out of it, but for the protection of their other interests.

The President—I think Mr. King answered that question very fully at the beginning.

Mr. Scofield—I am not satisfied with his answer. If he had an independent plant, and was obliged to erect buildings, etc., for its housing, and to charge for superintendence, I fail to see where his profit was to

come from. However, I will not stop to discuss that part of it. The question to my mind is whether it is practicable, and whether it would be advisable, for gas companies to adopt the electric light and run it in connection with gas, for the sake of protecting their gas interests. I have ignored this electric light business entirely. Of course they visited Fort Scott, Kans., as they did other little towns, and tried the same tactics with me as they did with others. Having boasted pretty loudly to our City Council, they finally succeeded in wresting the public lighting from me; but what looked at first like disaster finally proved a big benefit to me. When they got that contract we furnished 56 street lamps to the city, for which we got $18 per annum each, the lights being extinguished at midnight. They agreed to light the place, for a certain sum, for one year. After the system had been in operation a short time the people became dissatisfied with the plan, and the discontent steadily increased. I beheld the leaven working, and pretty soon the electricians thought they read "the handwriting on the wall," and they were not mistaken. At the end of the first year, despite the 15 miles of electric light wire spread through the city, the City Council—the Councilmen who originally helped the electricians were the first to throw the latter overboard—said, "We have had enough of the electric light;" and the people echoed that assertion. The Council then asked for bids for public lighting for the ensuing year, and this invitation was accepted by five bidders—three on behalf of the electric light, one with natural gas, and one with artificial gas. I thought it was time to "climb on top," if possible, so I put in a bid to light the streets with gas for three years, and was awarded the contract. The electric light was thrown out. No electric light is now seen on our streets, simply because the people were not satisfied with it. Now, although I light at a low price, instead of lighting 56 lamps, as was the case before, the Councilmen have already located 220, and they will get the number up to 300 before they get through. So you see that I am "on top." I have defeated the electricians, and their advent has been a benefit to me. The question with me is whether it was better for me to run the electric light, or let somebody else run it, and after the people had had enough of it have the Council give me 300 gas posts instead of 50. I am to light those gas lamps all night, in the dark phases of the moon, at $18 per year. There is not much money in it, but as I can make the gas without increasing my plant, why, there is no great loss in it either. In order, however, to get the increased number of lights I made a proposition to the city, saying I would extend my mains all over the district whevever they would locate one or two lamps on a block—our blocks are 333 feet one way by 270 feet the other—so they located (instead of two lights on a 700-foot block, as before) two on a block 333 feet long, following that scale pretty much over the entire city. Even in the hour of victory, however, I am inclined to seriously consider the question whether or not it would be better for us to take in the electric light and, where necessary, natural gas, and combine them under our own direction. I have opposed that idea right along, but am now disposed to go over to the ranks of those who think the other way, although I am not satisfied that our friend King will get very rich running the electric light at the price he mentions. The question is whether it is better for us to do this, or to go on and keep up an eternal fighting competition with the electric light and other interests. I have been about converted, and have about made up my mind that the best thing to do is to merge these conflicting interests. Even if we do not make a dollar out of electric light or natural gas supply, we will at least control the entire lighting situation.

Mr. King—I believe I started by saying this was a thing that must be handled locally, or according to prevailing conditions, further premising that in our case we were satisfied we had done the right thing. From the showing of the year it seems that others so far may have also done the right thing. I understand that my friend Littleton, at Quincy, Ills., is not to-day selling any gas to the city, while on the north of us, at Bloomington, the Gas Company has also lost the city lighting, which is being done by the electricians. In fact a similar condition prevails all over my immediate vicinity, except at Springfield. The gas companies are losing their grip on public lighting. Our object was to control the city lighting, whether we made a dollar out of the electric light or not. If we held our gas lights we were doing well. That is the way we look at it from our local standpoint. We do not care now if electric light is a failure for lighting a certain part of the city, for we can still light that with gas, and can also give them whichever light they want. Again, we have not had the fate, as to lighting the city, that otherwise we probably would have met were we not in control of the gas and electric supply. Wishing to retain the city lighting, we do not care whether the result of 10 years proves that we have not made, in the way of profit, a single dollar on our electric lighting business, for we shall believe that it has helped us in our gas business—provided, of course, that our sales of electric light have enabled us to pay simple interest on the cost, and to keep in order the plant that we operate. I am glad to hear that Mr. Scofield is likely to become a convert, because I believe that, under the circumstances in which he is placed, he will still find it is the best thing for the owner of a gas company to do. I do not believe that the electric light is a very profitable thing for an outside company to attempt to supply—I am not arguing on that question at all, but simply speak from my standpoint as a gas man who proposes to use up what was a waste material in firing boilers to run dynamos. In the first year that we have run our electric plant to its capacity the operation has been satisfactory; and if we can so report in regard to a business which was entirely new to us, I believe the second year's work will be performed still cheaper and better. We are making gas more cheaply to-day than we did ten years ago, and I think I can learn much about running an electric light plant economically that I do not now know, and consequently expect to make this year's showing superior to that of last year. As to the point of not charging for superintendence, so many people look at that matter in different lights that I leave it to you to do just as you think best. As to the actual figures for running the plant and keeping up all repairs, on a plant of the capacity stated, we have expended $1,935.80.

Mr. Howard—When did you reduce the price of gas?

Mr. King—A year or two before we took up the electric light.

Mr. Howard—Have you any Lungren burners in your city?

Mr. King—I have one that I use myself, and two or three have been placed in the public institutions before spoken of by me. Our merchants as a rule close their shops at 6 o'clock, and so we have no outlet for these burners in that direction. The electric lights are chiefly used in the saloons.

Mr. Jenkins—Will Mr. Scofield say what was the price of public lighting before and after the arc street lamps were introduced in Fort Scott?

Mr. Scofield—We received $17.50 per post for half the night, and now get $18 for all night. We are furnishing ordinary consumers at $2.50 per thousand; large consumers, such as railroad companies, hotels, etc., are supplied at $2.

Mr. Page—It is a remarkable fact that the electric light in England, where it was first introduced in a large way, has been almost an utter failure. In fact some of our American cities, having between 30 or 40 thousand inhabitants, can show a greater number of electric lights than can be found in the great city of London to-day. Naturally, the question at once arises, why is this so? Friend King has explained that there is no money in the electric light in competition with—what? With gas at from 60 cents to $1 per thousand? No; but that there is no money in electric lighting with gas at $1.25, or even at $1.50. That is, no money for the electric lighting company. But there is money, without any question, for the gas company in running the electric light. I am satisfied that a majority of the companies in the United States will be running electric lights within the next three years. They must absorb it; it cannot be otherwise. Every electric light company now organized wants to sell out to the gas company. The electrical people are anxious to to make the trade, but you do not want to huy out everything from these promoters. You want to buy your dynamos where you can buy them cheapest. You can buy wire from the Washburn & Moen Company cheaper than the electric companies can; and why? because, for one reason, your credit is better. You can plant the poles more cheaply, because you are used to such work. Another thing I can say to the gas men that is worth hearing. The carbons are an important item of expense in electric lighting; you will all admit that. When they were 12 cents per thousand they were an expensive item enough, but the carbon manufacturers, having pooled their issues, have raised the price to 35 cents. Now, the manufacture of carbons can be carried on on the premises of any gas company. A large portion of the material (retort carbon) is ready to your hands, and the retort will, when the carbon material is ground and mixed, give you plenty of baking space. Possibly one of the best things that can be done at this convention would be to appoint a committee to look into the cost of manufacturing carbons, and report upon the advisability of making these yourselves.

Mr. Boardman—I think we ought to look at this question on both sides, and having heard something of the rosy portion, let us look on the dark side. In Macon, Ga., we had almost come to the conclusion to buy out the electric light plant. They had a five-year contract with the city, which contained only one little flaw, at least that we could discover. We agreed upon the price, but when we found they could not give us proper deeds to it (owing to some slight hitch) the bargain was declared off. Soon after I heard that the Council were merely waiting for us to get control of this plant by purchase, when they (the Council) proposed to declare the contract forfeited because certain stipulations had not been

complied with. The owners of a gas company who go into this business will have to look out for trouble ahead; and while I believe it is a matter that should be thoroughly examined, I nevertheless think we ought to be in possession of stronger facts than those at present urged as reasons why we should embark in the business of a dual lighting supply.

The discussion was declared closed, and the Association ordered an adjournment, to terminate at 10 A.M. of the following day.

Second Day—Morning Session.

Routine business marked the introduction of the sessions for the second day. The Finance Committee of Board of Directors reported that they had examined the books, vouchers, and accounts of the Secretary and Treasurer, and decided that these were correct in all particulars. The report was filed.

Report of Special Committee on the Proposed Formation of an American Gas Institute.

The Special Committee appointed to consider the above-named proposition presented the following report:

We, the Committee appointed to consider what action should be taken with regard to the suggestions contained in the paper read by Mr. Frederic Egner, herewith report that, while there can be no doubt that the objects designed to be accomplished by the proposed American Gas Institute would result beneficially both to gas manufacturers and gas consumers, yet, from past experiences there *does* exist a great doubt if a sufficient number of gas companies can be induced to enter into an arrangement or agreement to supply the pecuniary aid necessary to carry the purposes in view into effect. We would, however, recommend that a Committee, to be known as the Committee on the American Gas Institute, be appointed, who shall issue a circular letter, under the heading and seal of the Western Gas Association, to all the gas companies of the United States, calling the attention of such companies to the paper mentioned, which will be published, in the regular transactions of this Association, by its official organ. Also, to inclose in said letters a series of questions bearing on the subject, such as the Committee may deem of importance, and to clearly express the action that each and every company addressed will take in the matter—whether they will agree to enter the defensive federation, or the Gas Institute portion of the scheme, for the investigation and promulgation of useful knowledge, only; how much, and for how long, they will contribute to its support; and whatever else they may be pleased to communicate. When the replies have been received, the proper Committee shall report, in writing, to the President and Board of Directors of the Western Gas Association as to what conclusions they have arrived at, and submit the facts as ascertained by them. Then, should these data be favorable to the establishment of the American Gas Institute, an extra session of the Western Association shall be called, or else a meeting of the Board of Directors shall be convened, who shall thereupon devise further steps to satisfactorily accomplish the desired end.

Or, in lieu of all this, the Committee on the American Gas Institute shall be empowered to take all necessary steps to accomplish the work, and report at the next annual meeting of this Association.

E. McMillin,
Frederic Egner,
Henry Pratt,
} Committee.

Mr. Watts Offers a Resolution.

When the report had been read the Secretary announced that Mr. Sylvester Watts wished to submit the following resolution, which proposed to accomplish the end in view by means somewhat unlike those urged by the Special Committee. The Watts resolution is appended:

Resolved, That a Committee of five, to be known as the Committee on Establishing an American Gas Institute, and to be composed of the President, First Vice-President, Secretary, and two members of the Western Gas Association, shall be designated and clothed with full powers to act as they may deem advisable, and find possible, in the premises as set forth in the paper read by Mr. Frederic Egner at the Tenth Annual Meeting of the Western Gas Association. The progress made in the work of the Committee to be reported from time to time in the official organ of the Association, and such other journals as may be deemed advantageous aids in spreading such information, and to be instructed to report in full at the next regular meeting of the Western Gas Association. Furthermore, that Secretary Littleton be asked to invite the other Gas Associations of America to take action, and co-operate with this Association in the matter of establishing an American Gas Institute.

The report and resolutions were then subjected to the following discussion:

The President—What is your pleasure with regard to the resolution offered by Mr. Watts? That differs from the report of the Special Committee only in the matter of the number and personnel of the membership of the permanent Committee.

Mr. Pratt—If either the report or resolution is now adopted, are we to understand that such action will terminate or shut of all debate?

The President—Not necessarily.

Mr. McMillin—It seems to me you seek to exact too much work from your officers. We have a membership of something like 200 in this Association, and I think the work of carrying on its affairs should be more widely distributed than it is. Having signed the report of the Committee I must, of course, indorse the sentiments of the Watts' resolution, but I will dissent from the recommendation in regard to naming the Committee. I think that its proposition, to say the least, is hardly judicious, especially so far as the Secretary is concerned. Instead of placing too much work on his shoulders, let us distribute the labor among the members of the Association as much as possible. As a rule, you elect the active members of your Association to hold office—men who, having a great deal of work to do, have but little spare time. Yesterday we put on them the additional duty of selecting those who are henceforth to read papers, and the further task of naming the subjects upon which the papers are to be prepared was assigned them. Now, that means no small addition to their labors. I myself would very much prefer that this Committee be taken from among the members of the Association who are not officers.

Mr. Watts—I do not think the officers will have much to complain about in regard to the extra work involved in serving on this Institute Committee, because most of the work would be done by Mr. Egner, as the promoter of this scheme. I think it would be well for the officers of the Association to be on the Committee, and to consider the subject fully, so that whatever is done can be done in connection with the Association.

Tho President—The vote will first be taken on the Watts' resolution.

[The question was then put on the resolution, and it was declared lost.]

The President—The question now comes up on the adoption of the original report of the Committee.

Mr. Egner—The original report does not appoint a Committee to do the work. It merely recommends that a Committee be appointed.

Mr. Jenkins—There are two recommendations in the report. Which are you going to adopt? Do not let us adopt both of them. I move the adoption of the first recommendation—that is, the appointment of a Committee with power to get up statistics and instructions to report back.

The President—The question will come before you, then, on the first proposition.

Mr. Jenkins—Let the first proposition be read again, so that we can understand it.

[The report of the Committee was again read by the Secretery.]

The President—You have now heard both propositions read. What is your pleasure?

Mr. Pratt—I am not in favor of the report as a whole, for, although it is indorsed by the Special Committee, the understanding was that the Association would determine which proposition was to be accepted. I do not believe in the extra session proposition, for that will involve a larger and, to my mind at least, unnecessary expense.

The President—But the report leaves that at the option of the Committee.

Mr. Pratt—I should object to calling a special meeting for any such purpose. In the first place, I do not believe that an Institute of the sort suggested can be formed to comprehend or inclose all matters contained in that paper, for the simple reason that gas companies control their own business. We might possibly induce a few to go into such a thing, but most of the active members here are either gas engineers or superintendents, and are not stock owners or directors of companies. We might invite them to act, but further than that we have nothing to do with it. As soon as this committee or association is formed and in working order its decisions would become public property, therefore a gas company not a member of the Institute would be benefited as greatly as those which were members. While I would like to see it go into effect, I fear it is impracticable. Each engineer has to determine for his own company what is or is not suitable for its best interests.

The President—I do not want to stop debate on this subject, but I would remind you that we have considerable to do. Yesterday we went over all this matter thoroughly, and the Committee then appointed has handed in a report.

Mr. Howard—The report makes no allusion to or provision for the payment of any expenses that may be incurred.

The President—Adopt the report first, and then attend to the money provision.

Mr. Egner—The idea of the resolution offered by Mr. Watts was that somebody should start this thing, and that there was to be no preliminary expense about the matter. As Mr. Watts has said, I was willing to shoulder all the trouble and expense, only asking this Association to father the project. There should be some authority for what the Committee does. I am willing to have circulars printed and sent to the gas companies, and the answers received will be submitted to the Association. Some one must start this thing. If it is not started no progress will have been made, and the result will be that next year we will be further off from accomplishing anything than we are now.

The President—The question is on the adoption of the first proposition of the report of the Committee. The first proposition provides for the calling of an extra meeting of the Association, or a meeting of the Directors. The second proposition merely directs the Committee to report at the next meeting.

Mr. McMillin—The question as to those two plans ought to be discussed. I favor the second proposition, and, for that reason, will vote against the first one. It will turn this matter over to the Committee, with full power to act; and that power would include the power of negotiating with the Executive Committees of Associations other than our own. Of course, we cannot expect to run this as a Western Association matter. It must necessarily include all of the Associations. The power given to the Committee under the second plan would enable them to attend the meetings of other Associations and obtain the views of the fraternity at large on the matter. In that event their report to us next year would afford a solid working basis.

The question was then put on the findings of the Special Committee. The first proposition was declared lost, and the second was adopted.

Mr. Howard—Now, I think the Committee ought to be furnished with some money; or the Association ought to say that any money expended by them would be repaid. I move that $50 be appropriated for the use of the Committee. [Agreed to.]

The President—How many shall be appointed on that Committee?

Mr. McMillin—I move that a committee of three be appointed by the Chair, and that the gentlemen named be selected from those who reside in or near to St. Louis, in order that they may meet frequently and without unnecessary travel.

The motion was agreed to. The President appointed Messrs. Egner, Watts and King as the Committee.

Mr. B. E. Chollar, of Topeka, Kansas, now read his paper on—

THE RULE OF THE INVERSE SQUARES.

Of late years, and especially since the advent of the electric light, with its dazzling brilliancy and hardly less magnificent claims for "candle power and illumination," the testimony of the photometer has been invoked for the purpose of establishing, as facts, things so much at variance with the inferences of reason and common sense, that grave doubts have arisen, not only as to its accuracy as an instrument of precision, but also as to the truth of the so-called law upon which it is founded.

It was stated,* at the late meeting at Boston, Mass., that the investigation of this subject belongs more properly to the physical laboratory than to a gas convention; but while this remark is eminently true, the scientists are so very slow in coming to our relief that it may be, perhaps, not out of place for us in the meantime to agitate the matter among ourselves, and to do what little we can in our own way toward accounting for and explaining some of the apparent inconsistencies of our optical yard-stick.

There is an old French nursery rhyme which runs thus:

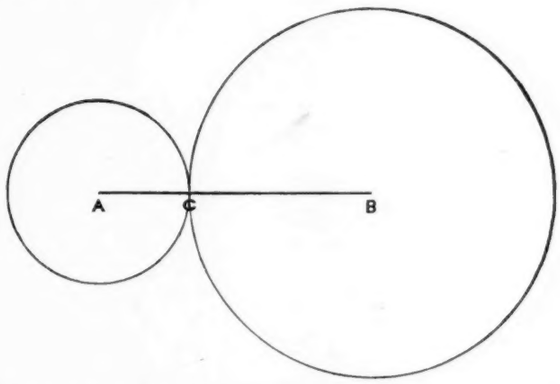
> Quand nos trois poules vout aux champs,
> La premiere va par devant,
> La deuxieme suit la premiere,
> La troisieme est la derniere.

Translated into English it tells us that when our three chickens go out into the field, the first one goes ahead, the second follows the first, and the third one is last.

Writers on gas and gas lighting seem to have followed pretty nearly the same practice; for almost without exception they have prefaced the discussion of the subject of light measurement with the broad assertion that the practice of photometry is based upon the natural law that the light from a luminous body decreases in proportion to the square of the distance. The exact agreement in idea, taken in connection with a remarkable similarity of enunciation without attempt at proof, would seem to justify the suspicion, at least, that a majority of the authors have followed the custom of the chickens, and have assumed as true what had been so laid down by their predecessors. Professor Tait, of Edinburgh, however, in his article on "Light," in the last edition of the *Encyclopedia Britannica*, states the law differently, and in such a way as to show very plainly that he, at least, is no chicken. He puts it thus:

"If the medium be transparent, the intensity of illumination which a luminous point can produce on a white surface directly exposed to it is inversely as the square of the distance."

An examination of the following diagram will show that the idea that the law of inverse squares is a natural law of light is a mistaken one, and that the real law in the case is neither more nor less than the geometrical principle that the surfaces of spheres are to each other as the squares of their diameters.



Let *A* and *B* represent two luminous points, and *C*, in a straight line between them, the point of equal illumination. The intensities of the two lights will be measured by the surfaces of the two spheres, *A* and *B*, which surfaces are to each other as the squares of the radii, *AC* and *BC*; but these two radii represent the distances of the lights, hence the intensities of the two lights are to each other inversely as the squares of their distances.

The following simple corollaries deduced from the above are almost self-evident:

1. Since a sphere can have only one center, and that center must be a point, it follows that the law, when applied to lights, can hold good only for luminous points.

2. Since only divergent straight lines can be drawn from a common point, the law can hold good only for divergent rays.

3. *A* and *B*, being assumed as points, are alike in size; but since the light from one is more intense than that from the other, it follows that the intensity of a light is independent of its size.

Let us now reverse the conditions and consider the relative values of lights of appreciable magnitude.

Let *AD* (see diagram, p. 8) represent a luminous line emitting divergent rays from every point. We may suppose a point, *E*, at which rays will converge from every point of *AD*. Now, since light moves in straight lines, all rays starting from *AD* in the direction of *E* must remain within the limits of the triangle, *AED*; section, *ee*, of *AED*, therefore, parallel with *AD*, will represent aggregates of light waves or quantities of light equal to each other and equal to the total quantity emitted by *AD*.

It appears, therefore, that, irrespective of intensity, the quantity of light from a luminous body at any particular point is independent of the distance of the body, and is in direct proportion to its diameter. If the above reasoning is correct, the total energy exerted by a light is represented by the product of two factors, one of which being increased the other can be correspondingly reduced.

The rule governing the value of lights, therefore, would be something like this:

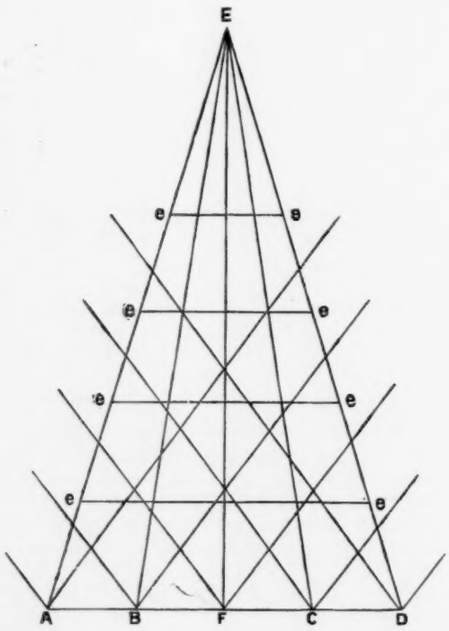
The light from a luminous body is inversely as the square of its distance, and directly as its projected area.

This is strictly in accordance with the all-pervading law of mechanics, that the work done is a function of force and time. The power of an electric current is expressed by the product of a volt and the ampere. So, also, the value of a light should be measured by the product of its intensity and quantity. Electric lights, by reason of their small size and great intensity, are analogous to small currents of high electromotive force, while the larger and less intense gas lights correspond to larger currents of less potential. The "light of the future" adheres closely to the rule of inverse squares, and rapidly becomes thinner and

*See JOURNAL, March 2, 1887, p. 141.

thinner as the distance increases; while on the other hand the old, reliable gas light is more equable in its distribution, and sends a greater proportion to a longer distance.

In the interesting experiment described by Mr. Boardman,* although with the same consumption of gas the student lamp chimney produced a greater intensity of light, the practical test demonstrated that the product of size and intensity or total energy was greater with the Argand. So, also, with the experiment with opal globes mentioned by Mr. Prichard.† The use of the shades undoubtedly reduced the intensity of the light, but the great increase in size produced a large preponderance of convergent rays, which, according to the foregoing, were not governed by the law of inverse squares, but held heir own to a greater distance, and lighted



the room more uniformly, but a little less brilliantly than before. The following method, therefore, suggests itself as a means of getting photometric measurements approximating to accuracy. The intensity of the lights should be compared through small apertures as close to the lights as practicable. The ratio of the intensity thus obtained multiplied by the ratio of size ought to give the relative value of the two.

The unequal brilliancy of the colors of the spectrum is quite noticeable, and Fraunhofer found that if the greatest intensity, which is between the yellow and green, be represented by 1,000, the orange would be 640, the red 63, the green 480, the blue 170, the indigo 31, and the violet 6. Dr. Schilling, in his work on spectrum analysis, gives the following as the proportions which the various colors occupy in the spectrum: If the whole length be 100, the red would be represented by 12, orange 7, yellow 13, green 17, blue 17, indigo 11, violet 23. Combining these ratios of intensity and quantity, we find that the red, orange, yellow, and green occupy 49 per cent. of the length of the spectrum, and furnish 90 per cent. of its illuminating power, while the blue, indigo, and violet take up 51 per cent. of the length and give only 10 per cent. of the light.

Now it happens that gas lights are by far richer in the rays of the red end of the spectrum than are the electric, especially the arc lights. We have, therefore, a decided advantage, both in regard to size and quality—size giving reaching power, or what is probably meant by the term diffusiveness, while quality, or color, determines the proportion of useful rays.

What we want to do, therefore, in order to put our gas "where it will do the most good," is to obtain the largest and brightest flames in proportion to the quantity of gas used. In order to do this we must drop empiricism and go at the matter as thoroughly and systematically as the electricians do in their measurements. Scientific research is exerted more energetically as a power directly behind their business than ours. They need now and will continue to need every advantage that they will be able to obtain, and the very fact that, under the protection of patent laws, dynamos and electric apparatus in general can be bought in open market without charge of royalty for subsequent use, is ample proof that the business of electric lighting can hardly be considered as even fairly profitable.

With industry and energy on our part there need be no fear for the future of gas lighting.

Fully nine-tenths of our gas, so far as lighting is concerned, will be consumed with the ordinary flat-flame burners. These, then, should receive the greater share of our attention; and it is safe to say that, by patience and perseverance, the flames of our ordinary burners can be enlarged and brightened up to such an extent as nearly to double the quantity of light now obtained in ordinary practice.

With regard to burners of high illuminating power, it is hardly possible to imagine a more complete arrangement than that of the Siemens-Lungren. The flame is both big and bright, and every bit of its surface is utilized. A flame is largely transparent to its own light. There ought to be, therefore, no opaque draft tubes or deflectors to shut off in any direction any part of the light actually developed. All these desirable conditions are to be found combined in the Siemens-Lungren lamp—hence its wonderful success.

If the ideas herein expressed are correct, we may reasonably expect that, with a fair test and fair count, the gigantic claims of the electricians can be scaled down, and the more moderate pretensions of the representatives of gas lighting enhanced to a degree that will enable the larger lamps of the Lungren type to compete successfully with the nominal 1,200 and 2,000-candle power electric lights.

(To be continued.)

Spectroscopical Test of Tar Colors.

"O. L.," in the June issue of the *Journal of the Franklin Institute*, notes that artificial and natural dye stuffs are tested with regard to shade and purity, as well as strength, by simple dyeing, which requires great practice and shows differences in strength of but 5 per cent. only with difficulty, whilst differences in shade often lead to errors in estimating the strength.

The investigations of H. W. Vogel, K. Vierordt, and G. Kruss have rendered it possible to determine, with rapidity and accuracy, the amount of coloring matter in a solution. The method is based on the following considerations: Every substance can absorb only those rays of light which have the same rate of vibration as its own molecules, producing, therefore, absorption bands in the spectrum of the light reflected by it. With the same light, the absorption band is the darker the greater the amount of the absorbing (colored) substance contained in the unit of space, and there is a simple relation between the absorption of the light and the quantity of coloring matter.

If $\frac{1}{2}$ of the rays of a beam of light pass through a 1 cm. stratum of color solution, a second similar stratum will allow only $\frac{1}{2}$ of this $\frac{1}{2}$ to pass through it, and so on. The same result is obtained if, instead of the light passing through two such strata of solution, it passes through one of double strength. Therefore, if the amount of light which passes through a 1 cm. stratum of a solution containing 1 mg. of color in 1 l. $= a$, then the amount of light passing through a solution of x times the concentration of the former is $b = ax$, where x indicates the number of mg. of coloring matter in 1 l. solution, or $\log b = x \log a$, or $x = \log b \div \log a$. The quantities a and b are easily and rapidly determined by the spectroscope. P. Schoop has adapted Kruss's apparatus for quantitative spectral analysis for practical purposes. The instrument consists of a tube with slit, prism, and telescope, which is so arranged that any position in the spectrum can be examined and determined.

The slit is divided in two halves; the upper is movable, the lower is fixed. Immediately in front of the lower slit is placed a vessel with parallel glass slides, 1 cm. apart, to hold the solution of dye stuff to be tested. By regulating the height of the solution in this vessel two spectra are obtained, one of the source of light, (a petroleum lamp), and the other the absorption spectrum of the solution. The darkest part of the latter is then found, and the movable slit regulated until the amount of light in each spectrum is equal. The extent of movement is shown on a drum attached to the micrometer screw, and serves as measure for the intensity of the light, that of the upper slit being the unit. The average of a number of readings, which can be made comfortably within a minute, is put down as the intensity of the light.

Having in this manner determined the intensity of light, for a normal solution of a dye stuff, a similar determination at the same position of the spectrum suffices to calculate at once the concentration of a solution to be tested with the aid of the above formula.

Dilution causes no change in the position of the maximal absorption,

*See JOURNAL, Jan. 3, 1887, p. 7.
†See JOURNAL, March 2, 1887, p. 139.

and the spectrum of a mixture of two color solutions is equal to the sum of the absorption spectra of the single solutions.

The apparatus can also be used to analyze commercial mixtures of two and more colors; also to determine the end of the reaction in the formation of coloring matter (rosaniline by arsenic acid, or nitro-benzol, methyl violet, bluemelts, etc.), also for standardizing colored salt solutions for analytical purposes (permanganate) and for color reactions.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, June 10, 1887.

The Forthcoming Meeting of the Gas Institute—Jubilee Rejoicings—The Electric Light and Plant Life—Gas for Cooking and Heating—At the Exhibitions.

The notices and particulars of the proceedings at the next meeting of the Gas Institute, to be held at Glasgow, on the 28th inst., and two following days, under the presidency of Mr. Wm. Foulis, M. Inst. C. E., have been issued to the members, and no doubt perused by them with some gratification. That is to say, by those who are able to count on being present. The absentees will be more numerous than usual this year, because the Council have been unfortunate in their choice of the date. The rules provide that the meeting shall be held on the second Tuesday in June, which falls on the 14th inst. But this year, on account of the Jubilee rejoicings, to be held on the 20th inst., throughout the country, in connection with which it is anticipated that large demands will be made on the "illuminating power" of coal gas, thus throwing an increased amount of labor and responsibility upon the managers of gas works, it has been thought that the general convenience would be assisted by postponing the meeting till after the Jubilee day. In so doing, however, the Council have only escaped Scylla in order to fall into Charybdis; for in selecting the last three days of the half year, just when the meter indices and the stocks have to be taken, they have chosen a date when the managers—of small works at any rate—are obliged to be at their posts and cannot be away, unless they are so fortunate as to have a reliable assistant who will keep things going properly during their absence. In large works of such magnitude as to require a responsible superintendent at the head of each department of course this objection does not apply; and possibly, as one of the sufferers, the writer is inclined to unduly magnify its importance.

The programme comprises eleven papers, and the principal feature of it is that several "master minds" are going to deal with topics to which it is known they have given special attention, and with which their names are intimately associated. Mr. Geo. Livesey is going to speak on "the Sliding Scale;" and the subject of "Gas Legislation" will receive attention from Mr. W. J. Warner. Dr. Stevenson Mcadam is to treat on "Gas from Oil;" and Mr. D. R. Stewart, of Broxburn, will read a paper entitled "Some Notes on the Distillation of Shale for Oil Making, and the Manufacture of Sulphate of Ammonia." This paper claims especial interest, because a visit to the Broxburn oil works is a feature of the proceedings. Mr. John Head, manager to the firm of Siemens Bros., has something to say about the "Siemens Regenerative Furnace" which is used at the Glasgow gas works. And we must not forget to welcome the reappearance of the name of Mr. Geo. Anderson on the Institute programme. This gentleman has contributed many useful papers at past meetings, but latterly his name has not appeared so frequently, as, in the interests of the gas industry and of progress, it might do. After the meeting a day's recreation, as usual, is to be enjoyed, and this time it takes the very attractive form of a long steamboat excursion—down the Clyde, through the Kyles of Bute, and up Loch Fyne, amidst the lovely scenery for which Scotland is so justly celebrated. The genial and gallant editor of the *Journal of Gas Lighting*, at the behest of a correspondent, has made inquiries and is able to announce that the presence of ladies will be welcomed at the trip. This is as it should be, for it is difficult to conceive a more miserable looking herd than a party composed entirely of the male sex doomed to a long day on the water together. Only, why was it not put on the programme?

The preparations for the Jubilee rejoicings have now commenced in earnest. The British public, having remained in a quiescent state, with the exception of an occasional inquiry as to what their neighbors are going to do, and a grumble at the absurdity of festive rejoicings in general, and this one in particular, until nearly the last minute, as is their wont, have now roused up thoroughly, and decided that the thing must be carried through in thorough good style. Accordingly in every town the air is filled with the voices of Committeemen and of honorary collectors for subscriptions; whilst the respective merits of free dinners, torchlight processions, triumphal arches and street decorations, treats to the school-children, illuminations and fireworks, are discussed at such length as to impede ordinary business operations. Most of the well-known gas fitting firms are applying their resources to the production of new designs in the way of gas illuminations. And the fact that the Jubilee day happens to come upon the longest day of the year, when the shades of darkness do not fall until after 9 P.M., does not appear to curtail the public desire for something brilliant after dark. So far as the interests of gas companies are concerned the short hours of darkness are just as well. For the illumination department, carrying with it an abnormal increase in the demand for gas, extending only over a night or so, is not a source of profit. In some parts, notably in the West End of London, it is rumored that gas illumination on a very large scale will be carried out. The question of supplying gas for illuminating purposes gratis has been debated in many districts, and especially in towns where the gas works belong to the local authority. But the plan does not find much favor. In the first place the Parliamentary restrictions imposed upon most gas undertakings are so stringent that it is doubtful whether they are able to "give away" gas for any purpose. In one town I notice that gas will be given, subject to the device that it is to supply being approved by a committee; and this is a very wise precaution, because if gas is to be had for nothing people rout up any old worn-out device that can be met with, or hurriedly construct something or other, in anything but a workmanlike manner, that perhaps passes as much gas by leakage as it consumes in a legitimate way. There is also the fact that many of the business houses that are illuminated, especially inns and restaurants, make the thing more or less of an advertisement. But the chief objection to unlimited gas illuminations is that whilst the mains are laid with a due regard for increased consumption, festivals of this kind occur so rarely that no provision is made to meet them, and the supply pipes are therefore unequal to so large a strain in addition to their ordinary duty. I remember once that, on the occasion of a local rejoicing, a large number of gas illuminations were erected in all parts of a small town which was situated on the side of a hill. The carrying power of the main pipes was greatly overtaxed, with the result that the upper parts of the district fairly sucked the lower levels dry. The bulk of the gas was consumed at the higher altitudes, and in the low districts the illuminations would not keep alight, nor was the state of things any better in the houses.

It will be remembered that, when the modern electric light mania was commenced, one of the pretentious claims advanced for it was that its resemblance to sunlight was so far complete as to secure a share of that stimulating influence on plant life which is a special and beneficent characteristic of the orb of day. Reports of extraordinary "forcing" processes conducted by this medium were freely circulated. I remember inquiring at the time if the electric light would also "tan" ladies' complexions, and fade carpets and window hangings, to which no answer was forthcoming. The experience at the Winter Palace at St. Petersburgh does not tend to advance claims of this nature, for its effects on the ornamental plants, especially the celebrated collection of palms, have been most disastrous. The complete illumination for only one night will, it is said, cause the leaves to become dry, yellow, and withered, and the injury is proportioned to the extent of the exposure. Plants situated in the full glare of the light suffer most, and those in niches or places protected from the direct rays of the light remain uninjured.

There is a very satisfactory amount of energy in the gas stove business. Exhibitions of gas appliances are evidently not yet spun out, although they have now been before the public for several years; for the serial literature of the last month or so comprises accounts of several very successful undertakings of this class. And in towns where exhibitions have previously been held lectures on cookery, illustrated by means of stoves, are found to be very successful as a means of retaining the public attention and interest in the uses of coal gas as a domestic agent. As an example of the extent to which gas is being introduced in our large towns, Glasgow may be mentioned. Mr. Foulis has arranged a gas burner suitable for fixing in the ovens of existing kitchen ranges, thus converting them into gas cookers. These are supplied on hire, as the ordinary gas stoves are supplied, and no less than 1,550 of them have been sent out. So far as may be judged by the official patent lists considerable activity prevails among inventors in the line of gas appliances. Among the novelties that have actually been put upon the market this season is a gas boiling stove that is automatically turned on and lighted through the medium of a flash jet by the simple act of placing a kettle or other vessel upon it, and the removing of the vessel secures the shutting off of the gas.

Speaking of exhibitions reminds me that several shows of this kind, partaking of a general technical character, in which gas has been well represented as one of the principal industries of the country, have recently

been held or are at present open. The Manchester Royal Exhibition may be instanced, in which, amongst a large variety of exhibits, may be seen a great many different sorts and sizes of gas engines, models of purifying and storage plant, engines and exhausters, coke breakers, retort lids and mouthpieces, models of sulphate of ammonia apparatus, etc. At the Yorkshire Fine Art and Industrial Exhibition gas and cognate industries were represented, and Mr. C. Sellars, Secretary and Manager to the York United Gas Company, gave an interesting lecture on "Gas and Some of Its Residuals," which consisted of a very able review of this fertile subject. There is also the industrial exhibition at Newcastle-on-Tyne, where one noticeable feature is a complete model showing a coal mine in full operation. Altogether, the public cannot complain that they have no opportunity of acquiring general knowledge on the subject of gas and gas manufacture; and it is to be hoped that they will avail themselves of the same, and so put an end to the absurd prejudices which still crop up occasionally respecting the operations of gas companies. Only yesterday an intelligent and well-educated person, having inquired if it was not true that a gas meter would measure air with as much facility as gas, and being answered in the affirmative, at once jumped to the conclusion that the gas company could force either gas or air through his meter, as they might wish, and that they did not fail to send a considerable quantity of the latter. I mention this curious prejudice because it has more than once come to my notice lately as being entertained by individuals who were fairly well acquainted with the *modus operandi* of testing meters and gas works operations in general. One of this sort recently proceeded to the testing inspector's office, with his meter under his arm, to avail himself of the right provided by law of seeing the meter tested in his presence. As the operation was commencing he inquired if the gas as supplied to the public was used for the test, and was told that the meter would be tested with air, as being more economical than gas. He at once repudiated further dealings with the inspector, regarding him as a tool of "those artful gas people;" and rushed into print without delay to expose what he considered to be roguery, at the same time taking some credit for the pertinacity which had led to the supposed discovery.

Notes from the West.

By Retort.

June 25, 1887.

Probably at no other time in our history has the exploring of Mother Earth been so active as in the present. The derrick is becoming as familiar to the eye of the railroad traveler as the water tank—especially in Ohio and Indiana. In the former State it is settling down to a systematic feature of business, while in the latter all the excitement incident to its newness is experienced. Indianapolis, after many failures, has at last met success on the Harris farm, which lies 17 miles north of the city, and which, after being "shot" yesterday, commenced business as a "gusher," yielding 350 pounds pressure, and, it is estimated, an output of 3½ millions cubic feet per day. Piping will begin at once, and the supply is to be led into the city. This is the most successful well discovered so far south.

The development of natural gas has proven an admirable educator of the public in the use of gaseous fuel, and, as a result, the gas stove trade has been unusually active this season in the territory supplied exclusively with artificial gas. There are two things that materially retard this very important branch of our industry, the principal one of which is the price at which stoves must be sold. Gas companies, as a rule, sell all these goods at cost, and very often at a loss, for the sake of the increase in consumption; but even then a four-hole stove costs, on an average, about $25 to $30, while a three-hole costs about $20, put up ready for use. This very often defeats the sale, to a goodly number of consumers, for several seasons. What the public want (and the gas companies also) is a good gas stove that can be *placed ready for use* at prices about 40 per cent. cheaper than those now ruling—say, a three-hole stove, $12 to $15, and a four-hole at $16 to $20. There being a very large demand for just such a stove, it would meet with a ready sale.

The gas stove trade is in turn developing another feature in our industry, or rather an auxiliary—the cooking school. Those companies that have had the enterprise and good fortune to secure one of these schools have reaped a rich harvest (on account of all the money expended), for they have uniformly proven a wonderfully active advertiser of gas stoves, and thus led to many sales; but I find among the gas men an inability to obtain these teachers, the number being very limited as compared with the demand. Ohio and Iowa seem to lead in this department just now. Why would it not be a wise thing for the stove manufacturers to secure a number of competent ladies trained for this work? It would greatly extend their own business, besides giving lucrative employment to a goodly number of worthy women.

The Equalizing (?) Boards are just now holding their annual sittings, and will, as usual, give the gas companies their annual whack. It seems to be an unwritten law in many parts of the West that the gas company shall have its assessment raised by these wise (?) gentlemen who have a keen appreciation of the value of every other class of property—save their own—and who universally brand the sworn statement of the gas company as a dishonest attempt to undervalue its property. The first instance this year that came under my eye was that of the Indianapolis (Ind.) Gas Company, the property valuation of which I see, from a local paper of recent date, was raised from $414,076 to $467,340. I know very little of the value of the property, but this practice is becoming so very common that it is a serious matter with those whose money is invested in gas stocks; and the custom places a premium upon dishonesty, inasmuch as regularity in raising will beget regularity in depreciating the return.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

An Explosion at Rutland, Vt.—On the morning of Saturday, June 18, Rollin Clark, a clerk in the office of the Town Clerk of Rutland, opened the vault in order to hunt up some documents that he desired to examine. So as to expedite matters Clark ignited a match for the purpose of lighting the gas burner that illuminates the Rutland stronghold, and his action was attended with some astonishing results. An explosion accompanied the "striking of the match," and the inner door of the vault, torn violently from its hinges, sailed out to the main office, wherein it played havoc with the wainscoting, etc. The glass in the sashes of the main office was all destroyed, and the desks, fittings, etc., will require much attention at the hands of the furniture makers ere the Town Clerk can depend upon them as of yore. Clerk Clark, although pretty badly shaken up, did not receive any serious injuries, but it may be taken for granted that hereafter he will "smell for leaks" prior to "striking a match" in the receptacle devoted to the safe housing of Rutland's "pub. docs." The cause of the gas escape was traced to a defect in the service pipe that fed the vault burner.

A Hint or Two from Norfolk, Va.—As before noted in the Journal, Mr. T. A. Bates is now in the employ of the Norfolk Gas Light Company, his appointment as Superintendent to that Company having been made on April 1, of present year. On June 18 the directors decided to make a concession in gas rates, the same to take effect on 1st inst., and that action guarantees to the Norfolkites a satisfactory artificial illuminant at the net rate of $1.60 per thousand cubic feet. In cases where the meters show a monthly consumption having a total money value of $25 or upwards the net figure is placed at $1.50 per thousand. The Norfolk Company is fitted out with dual apparatus, which enables it to make either coal or water gas, the water gas plant being a specimen of the Granger class. Both plants are constructed on modern lines, and President Allmand, who is a firm believer in the efficacy of liberal methods of working, stands ready to give the patrons of his Company the benefit of reduced gas rates, whenever such concession is consistent with a just regard to the rights of his shareholders. The former net rate at Norfolk was $1.80.

A Tribute to the Memory of the Late Evan T. Jones.—We have received the following from Mr. T. A. Bates, of Norfolk, Va., which explains itself. Further, we can and do indorse every word of the graceful tribute thus paid to the merits of the deceased Superintendent: "Evan T. Jones, whose death occurred at Paducah, Ky., on June 11, 1887, had acted as Superintendent of the Paducah Gas Company from October, 1870, until the transfer of that plant was made by its former owners to new proprietors something over a year ago. Mr. Jones, who was a native of Wales, was born on February 13, 1822, and in early childhood (1828) came to this country, residing in and about Pittsburgh, Pa., until 1857, when he removed to Paducah, under engagement to take charge of the engines of a rolling mill which had been established at that place. The rolling mill venture, however, did not prove a success, and when the scheme failed Mr. Jones opened a gas and steam fitting shop in the city, subsequently taking part in the laying of the first gas mains put down in Paducah. The stirring events immediately preceding the war of the rebellion proved Mr. Jones to be strongly loyal to the Government, and he, with a very few others of that locality who shared his views, was saved from banishment by the opportune arrival of General Grant, who had just begun his glorious career, from Cairo,

Ills.—of course, it is understood that the people of that section of Kentucky were strongly imbued with secession ideas and aims. It is but the simple truth to say that were it not for his rather delicate physique, and the fact that a helpless family depended upon him for support, Mr. Jones would have gladly entered the ranks of those who so successfully contended for the preservation of the nation. The writer, who assisted in rebuilding the Paducah gas works—these had been destroyed during the warfare—and subsequently remained in charge of plant until 1870, at which period Mr. Jones assumed command. During these years an intimate friendship was established between the deceased and the writer, a friendship that remained unbroken up to the hour of separation enforced by death's decree. I can truly say that neither a better man nor truer friend ever lived than the one who forms the subject of these remarks. Let me here reproduce an extract from a local paper in regard to his decease, as evidence of the manner in which deceased was held by those who knew him best: 'His life has been quiet and unassuming (yet active in good works) and has been such as would lead to the impression that he had not knowingly or purposely ever committed a sinful act. He was both useful and good, setting good example to both older and younger people.' As a husband and father he was loving, kind and provident; in business, firm, just and honorable; as a friend, loyal, faithful and charitable. He was but little known to the fraternity, and that must be traced to his native modesty, which prevented or disinclined him from attendance in large assemblies; but those who were fortunate enough to call him friend will remember him until they also are no more. Having lived a Christian life, he now partakes of his reward for faithfulness unto the end."

A Summary of the Work of a Busy Firm.—Mr. James R. Floyd proprietor of the Oregon Iron Works, 531 to 543 West 20th street, this city, writing under date of June 22, says: "We send herewith a summary of the contracts so far secured by us during this season, and think it indicates that the gas industry is not sleeping: *Consolidated Gas Company, 14th St. Station.*—Furnishing and erecting one set of four purifiers, each 16 by 25 ft., with 20-inch connections; also iron work for 24 benches of sixes, including self-sealing mouthpiece and bridge-pipe lids. *Forty-second St. Station.*—Altering connections to two sets of purifiers (each) by removing the present 16-inch center-seals and connections, replacing the same with 20-inch center-seals, and 20 and 24-inch connections. *Forty-fourth St. Station.*—Furnishing and erecting one set of four purifiers, 24 ft. by 24 ft., with 20-inch connections; also, 24-inch connections to other apparatus. *Phila. Pa. Gas Works, Ninth Ward Station.*—Erecting new purifier house to contain set of four purifiers, each 17 ft. by 29 ft., with 20-inch connections, and Farmer's Duplex Center-Valve, for working four boxes at once. All of the above-named new purifiers will be equipped with our patent Hoisting Carriage for lifting the covers. *East Chester Gas Company, Mt. Vernon, N. Y.*—Iron work for two additional benches of sixes on the Stedman-Stanley furnace plan, and to include the Stiness main and Hutchinson tar displacing apparatus. *Standard Gas Company, 115th St. Station.*—Four multitubular condensers, and two scrubbers with 16-inch connections. We are also fitting self-sealing lids to 72 mouthpieces at North End Station of the Boston (Mass.) Gas Light Company. As, in addition to the above, more than the usual amount of repairs to benchwork is being done, you can see we do not anticipate any vacation prior to the coming October meeting." Well, Brother Floyd, you do not seem to be particularly downcast at the likelihood of losing the chance of following Messrs. Greenough, Cabot, Somerville and Morley in their flight abroad. Perhaps, however, there is a prospect of that sort in store for you next winter. Who knows?

Annual Meeting, American Water Works Association.—We are indebted to Brother J. H. Decker, the Hannibal (Mo.) gas man, for an invitation to attend the Seventh Annual Meeting of the above-named Association, for which body he acts as Secretary. The meeting, which is to be held in the West Hotel, Minneapolis, Minn., on the 13th, 14th and 15th days of July present month, bids fair to eclipse any of the preceding sessions, and we think so because the programme calls for the reading of no less than 13 specially prepared papers. Amongst the contributors we note the name of Col. Wm. Ludlow, who proposes to talk on the subject of "Water for Public Supplies." Mr. G. W. Pearson will discuss "Natural Filtration," and Mr. A. A. Godard is to outline the "Legal Relations of Consumers and Suppliers." The titles of the other papers bespeak a plenty of interesting themes to command the attention of the members. The local committee promise a treat in the shape of an excursion to the Lakes, and they have also arranged for excursion trips to many points and places worth seeing in the immediate vicinity of the great twin cities—Minneapolis and St. Paul—of the booming Northwest. If it is possible, Brother Decker, mid-July will see us in the neighborhood specified.

Down They Go.—We understand that the Directors of the Tarrytown and Irvington (N. Y.) Gas Light Company have made a reduction of 50 cents per thousand cubic feet in the price of their gas. The former rate was $3.

The Water's Frisky Ways at Johnstown, Pa.—In our last we explained that owing to the overflow of water from that ordinarily peaceful stream known as Stony Creek where it passes through Johnstown, Pa., the local gas works had been unable to supply light to the Johnstowners. Mr. James Williams, Superintendent to the Company, in a letter dated June 15, kindly posts us as to the trouble in the following manner: "The damage done to our works by the floods of the 7th inst. was very slight, merely necessitating a few hours' stoppage. In fact at the hight of the flow my holders were filled with gas, and could have delivered gas right along to the consumers, were it not for the injuries occasioned to the mains and services, owing to settling and breakage of meter connections, caused by floating debris in the cellars of houses, etc., our pipes became filled with water, thus involving us in considerable trouble. Indeed we have not yet been able to supply all our consumers. Since the bother began we have been busy night and day pumping out water and changing meters, for in many instances we found they had been completely filled up. We lost considerable gas on account of the breakages. Our pipe (a 6-inch wrought iron one) over the South bridge was struck by drift and the joints were started, being bent for about 8 inches in nearly a 1-16th bend; but although the bridge was badly wrecked the pipe remained. As we had a depth of 5 feet of water in our principal streets, I think, on the whole, we escaped remarkably well, especially as our plant is located on the bank of the Conemaugh river, half a mile above the point of junction of that stream with Stony Creek." Our readers will agree with Mr. Williams in the belief that it might have been worse with him.

Branching Out at Jamaica Plain, Mass.—President Pratt, of the Jamaica Plain Gas Light Company, having determined to supply the nearby district of Roslindale—the latter is perhaps 1½ miles distant from the Jamaica Plain gas works—with a plentiful supply of the light of the present, is now putting down the main system necessary to accomplish that object. He will also extend and perfect the general distribution system by the placing of the following sizes and lengths of pipes:

Length, in feet.	Size of Pipe.
6,000	8-inch.
4,000	6-inch.
12,000	4-inch,

Next year it is contemplated that the betterment in this line will be even greater than that spoken of above.

Bought Them Out.—We understand that the proprietors of the Salt Lake City (Utah) Gas Light Cempany have purchased a controlling interest in the shares of the local electric light company, and while the gas men will nominally conduct the new purchase as a matter entirely separate from their gas business, in reality the arrangement can be regarded as a case of combined electric light and gas supply. The Messrs. Ellerbeck were the instigators of the purchase.

Likewise at Lynn, Mass.—A controlling interest in the Lynn Electric Light Company has been purchased by the present owners of the Lynn Gas Light and the Thomson-Houston Electric Light Companies. This purchase virtually places the local Gas Company in control of the lighting interests of the city.

Gas for North Abington and Whitman, Mass.—It is reported that the negotiations looking to the erection of a gas plant for the supply of gas to the towns named have been satisfactorily concluded. The works will be constructed on a plot near the Hanover Branch Railroad, on the left bank of the small creek which divides the towns—the object being to secure a central point or station as a basis for supply. The capital stock ($15,000) has been subscribed, each town taking $7,500. North Abington, the larger of the two, is on the Plymouth Branch of the Old Colony Railroad, right at the junction of the latter with the Hanover Branch Railroad. It is 18 miles south-southeast of Boston.

Annual Election, Newark (N. J.) Gas Light Company.—The election for a Board of Directors for this Company resulted in the choice of Messrs. Eugene Vanderpool, I. M. Harrison, Theo. Runyon, E. H. Wright, J. R. Emery, R. F. Ballantine, M. L. Ward, H. Congar, and

F. Murphy. The last-named succeeded Mr. John I. Young, who refused a re-election.

Relief Granted.—Gov. Hill has signed the bill, introduced by Assemblyman Burns during the recent session of the New York State Legislature, under which the gas companies doing business in what is known as the annexed district of this city are allowed to charge consumers $1.60 per thousand cubic feet for gas supplied. Tardy justice, but nevertheless welcome.

Annual Election, Pawtucket, R. I.—The annual election of this Company resulted as follows: Directors, Messrs. D. Goff, L. B. Darling, H. Conant, G. L. Walker, A. H. Littlefield, E. A. Perrin, and G. W. Pratt. The Directors selected the following list of officers: President, L. B. Darling; Secretary, E. A. Perrin; Treasurer, C. L. Knight; Superintendent, S. G. Stiness; Collector, W. McGregor.

Connelly & Co., Limited—This enterprising firm keeps on in the even tenor of its way, seemingly undisturbed by the multiplicity of orders which find their destination at No. 177 Broadway, this city. Among the latest shipments made by the Messrs. Connelly we note the following: *Governors.*—Two 20-inch, to Nashville, Tenn.; two 16-inch, to Erie, Pa.; 12-inch, to Municipal Company, Albany, N. Y., St. Paul, Minn., Seattle, W. T., and Zanesville, O.; 10-inch, to Allentown, Pa., and Montclair, N. J.; 8-inch, to Waltham, Mass., Allentown, Pa., Malden, Mass., and Oakland, Cal.; 6-inch, to Mattoon, Ills., Jackson, Columbus and Meridian, Miss. *Steam Jet Exhausters.*—12-inch, to Central (N. Y.) Company, and 6-inch instruments to Hastings, N. Y., and Marquette, Mich. *Iron Sponge.*—In this department of their business the Messrs. Connelly report shipments aggregating 10,170 bushels, the largest individual purchasers having been the Equitable Company, city, 4,000 bushels; Chicago, Ills., Company, 3,000 bushels; Consumers Company, Los Angeles, Cal., 1,000 bushels; Richmond, Ind., Company, 600 bushels; and Citizens Company, Lynn, Mass., 600 bushels. The remaining lots (in 100 bushels or less) were taken by ten different companies. The above record carries with it the pleasing conviction that the gas men are no longer content to allow things to remain as they were. No; the "rule of thumb" days are nearly, if not quite, over.

The Standard Gas Light Company.—The promoters of this metropolitan enterprise are proceeding rapidly with construction work, and the station at 115th street, east of Pleasant avenue, is in a forward state. In connection with this plant we may mention that the Wilbraham Brothers (Phila., Pa.) are under contract to supply it with two (12-inch cylinder, 20-inch stroke) horizontal engines; also, two No. 7 Baker rotary or positive blowers.

An Item from Owosso, Mich.—We are indebted to Mr. O. F. Webster, Supt. of the Owosso Gas Light Company, for the knowledge that at the recent annual meeting of the Company Messrs. W. M. Kilpatrick, E. A. Todd, O. F. Webster, W. C. Stevens, H. S. Dean and Ludwick Dean were elected a board of directors. At the organization meeting Mr. Kilpatrick was chosen President, and Mr. Webster was re-elected Superintendent. The Company met with a serious loss in the death (on March 16) of Mr. C. K. Leonard, formerly a director in the corporation, and a suitable set of resolutions, expressive of the esteem in which deceased was held by his former co-workers, was agreed on by the Company's executive management. Supt. Webster ought to be somewhat elated over the business showing which he was able to outline to the stockholders; for the Company, although something less than two years of age, has earned an interest return on the money invested equivalent to 6 per cent. per annum. That has been done, too, with gas at $2 per thousand. No wonder that Mr. Webster was re-elected Superintendent!

The Proposed New Company at Springfield, Mass.—The coterie of speculators who are anxious to destroy or divide the business of the Springfield Gas Light Company, and who have adopted the name of the Equitable Gas Light Company—the coterie by this time is pretty well known in gas circles throughout the United States—appeared by counsel (Judge Gideon Wells) before the Springfield Aldermen on the evening of June 20. A large and representative audience witnessed the proceedings, which hinged on the Equitable Company's petition for the right to construct and operate a gas works in Springfield, and Judge Wells' arguments in favor of the petition did not differ greatly from those which other legal gentlemen representing the same parties have made such good use of in Baltimore, Md., Chicago, Ills., Utica, N. Y., and so on, but which did not exert a corresponding "moral effect" in Newark, N. J., or Syracuse, N. Y. We must say, however, that the Judge, when subjected to a very slight cross-examination, did not display that familiarity with his subject usually expected from one who knows whereof he speaks. In fact the Judge was a witness after "our own Sharp's" heart, for he (the Judge) could not say how the stock was to be subscribed for or distributed, except that "It is left to the directors to distribute it [the stock] as they see fit," from which it is fair to infer that some of the stock would be "distributed" where it would be likely to do the most good. Judge Wells, although he did not know the difference between water and oil gas, and was equally at sea regarding the cost of manufacture and the make-up of water gas in general, added that "a small subsidiary apparatus had been added to the invention (presumably referring to Jerzmanowski's invention) last year which enabled them (the petitioners) to make gas cheaper and better than that now used in Springfield." When asked how it was that Col. Graham, President of the New York Equitable Gas Company, had repeatedly asserted that gas could not be made and sold (in order to reap a profit on the transaction) at less than $1.75 per thousand, Judge Wells replied he "neither knew nor cared." Mr. Chas. L. Long, counsel for the old Springfield Company, conducted his end of the case in a thoroughly knowing manner, and exposed the aims of those who sought to speculate on the gas supply of Springfield. The matter, however, was adjourned over to the evening of July 6, on which date we may look for something like definite results. In the meantime, if the Springfield City Council desires to know more about the operations of the promoters who now petition it for an important franchise, we suggest that an examination of the Chicago, Baltimore and Utica instances be inquired into. Should the Councilmen do so they will speedily send these roving, would-be benefactors on to "seek pastures green and fields anew."

Mr. L. J. Howard is not Afraid of the Germanic.—Mr. L. J. Howard, of Evens & Howard, St. Louis, Mo., seems to have tired of traveling on the lordly (albeit muddy) bosom of the "Father of Waters," at least we so surmise from the fact that he took passage for Europe from this port on date of June 29. Although the Germanic did cut some queer antics a few weeks ago, Mr. Howard reasons that that past waywardness affords the best guarantee for her straight sailing in the immediate future, hence he commits his avoirdupois to her custody, and does it without a single dread. Mr. Howard will visit Great Britain and the Continent, and expects to compass the round trip in about two months.

Capital Increased.—The capital stock of the Spencer (Mass.) Gas Light Company has been increased in the sum of $25,000. Present capital, $75,000.

The Exact Figures.—The lighting of the public buildings of New Brunswick, N. J., under the electric system cost $450 last year. Gas is to be used for the next three years, and the premises will be lighted at an average cost af $340 per annum.

The New Works of the Denver (Col) Gas Company.—Some time ago we noted that Brother Fay was about to rebuild the Denver plant. We can supplement the former statement by publishing the following particulars. The new works are located on Wewatta street, commencing at Seventh, and extend to Tenth street, near the Platte river, in the territory locally known as "the Bottoms." The Company owns 6½ acres of ground on which it will erect three buildings, one of which (the retort House) is well underway, while the foundations of the others are already laid. The retort house (120 ft. by 65 ft. and 58 ft. high) is built of brick, stone and iron, the only woodwork in the structure being that in the window frames. The roof and floors are of iron, and the carbonizing plant is of the best. A regenerative system of firing will be followed. An elevated railway, now in process of construction, begins at Seventh street, connecting with a switch from the Denver, Texas and Gulf Railroad system, and runs to the rear of the retort house, thus securing great economy in the handling of the coal. The capacity of the new retort house is placed at a maximum of one million cubic feet per diem, and not many years will pass ere that sendout figure will have been reached. The second building, to be used as a condensing and purifying house, is also to be fireproof, and is to have the dimension of 82 ft. by 65 ft. The finished gas product is to be stored in the holders occupying the old site. At some distance from the purifying house a third building, one story in height, 120 ft. by 30 ft. in dimension, and fireproof, has been arranged for. It will be devoted exclusively to the manufacture of products from coal tar. This bare outline will afford some idea of the magnitude of the gas interest of Denver, and also goes to show that Brother Fay is not sleeping at his post—in fact he never did. By way of illustrating how the Denverites hold the improvements;

we reprint the following, from a recent issue of the Denver *Daily News*: "The new plant of the Gas Company assures a light supply for Denver for many years to come, and owing to its immensity the Company can afford to sell gas at a marvelously cheap rate. There are no better buildings for the purpose in the United States, and Mr. Fay certainly deserves credit for planning and erecting them." To which we respond, "Truthfully said."

CHEAPER GAS FOR LEAVENWORTH, KANSAS.—Brother Gimper may not yet have attained complete success in extracting 6½ cubic feet of 18-candle gas to the pound of coal carbonized, but he has solved the problem of selling gas cheaply. In proof of that assertion we submit the following evidence, which takes on the form of a notice recently circulated by him among the residents of Leavenworth: "From July 1, 1887, the price of gas will be reduced to $2 per thousand to all consumers. For the months of June, July, August and September the price of gas consumed in gas stoves will be $1.50 per thousand, provided that 2,000 cu. ft. be used each month." The former gross price was $2.25 per thousand, and as the discounts remain unchanged (5, 10, 15 and 20 per cent., according to quantities consumed), it will be noted that the concession is quite a liberal one, but the special rate on gas used in cooking stoves takes the prize.

TO USE THE JARVIS BOILER SETTING.—The Boston (Mass.) Gas Light Company has authorized the Jarvis Engineering Company to begin the work of arranging its boilers over the Jarvis Boiler Setting, so that coke breeze and screenings may be used for fuel. Gas companies throughout the country ought to look carefully into the Jarvis plan.

GLAD TO HEAR IT, BRO. TRACY.—We are indebted to Mr. Wm. Tracy, Supt. of the Peru, (Ind.) American Gas Company, for the following newsy letter: "To the Editor AMERICAN GAS LIGHT JOURNAL:—I have no doubt you have heard that there is some natural gas in Indiana, but perhaps you have not heard that our works have outgrown themselves. In fact I might say we are at this time building a complete new plant. Our present retort house is to be turned into a purifying house, and the new retort house will have a dimension of 50 ft. by 32 ft. by 20 ft. We will also construct new coal sheds, to be 54 ft. by 25 ft. by 18 ft. The retort house will be fitted with three arches large enough to receive 6 retorts each. The other plant will embrace purifiers (6 ft. by 8 ft.), exhauster, scrubber, condenser, etc., all complete. We hope to make gas in the new works by mid-August, and intend to supply Peru with good and cheap gas for years to come. The iron work for the construction mentioned is being furnished by the Kerr Murray Manufacturing Company, and thus adds another string to the many that will hold Brother Cressler in the State of Indiana during the present summer." This is a good illustration of the way in which business tact recoups itself. Two years or so ago the Peru Gas Company was detested by the people whom it sought to serve, and its plant, under the old management, would have been ample for years to come—that is, if the tactics which then ruled were persevered in. However, the former proprietors disposed of their property to men who did not want the earth, and now the purchasers have to double the capacity of their purchase in order to meet the wants of those whom they have dealt liberally with. Truly, common sense practice brings rich recompense.

KILLED BY ELECTRICITY.—Albert Lowell, an employee of the Troy (N. Y.) Electric Light Company, while renewing the carbons to a Congress street arc lamp, about midnight of June 11, received an electric shock that caused his death. Dr. Archambeault, who issued the death certificate, said that Lowell's back and sides were marked with a series of parallel streaks of a vivid red color.

NEW GAS COMPANY—The Jackson (O.) Gas and Electric Light Company has been organized. Capital, $50,000.

TO MAKE THE KORTING GAS ENGINE.—We are advised that the contract for making the Korting gas engine in this country has been awarded to Messrs. Warder, Bushnell & Glessner, of Springfield, Mass. Some time must elapse before orders for the Korting engine can be filled.

TYLER (TEXAS) TO HAVE GAS WORKS.—The Tyler City Council, on June 18, closed a contract with St. Louis (Mo.) parties for the immediate construction of a gas works at that place. Tyler is the capital of Smith county, and is 25 miles southeast of Mineola, which latter place is 77 miles east of Dallas. Mineola may soon be in the market for a like supply.

THEY BLEW UP THE GAS MAIN.—As it is in New York so also is it in the land of the setting sun. At least we judge so from the fact that while some men in the employ of the San Francisco Bridge Company were blasting out rocks in Tennessee street, on the Potrero, San Francisco, Cal., a few days ago, a blast broke the supply main of the San Francisco Gas Light Company, and the people had to do without light.

CHEAPER GAS FOR WARREN, OHIO.—Mr. George H. Tayler, Sec. and Supt. of the Warren Gas Light Company, kindly informs us about a matter which goes to show that his Company has taken a long stride in advance. Hitherto the prevailing gas schedule in Warren called for the payment of $2.25 (net) per thousand cubic feet in all instances in which the total monthly consumption was less than 5,000 cubic feet, but those who used over that quantity were entitled to a net rate of $2. The new schedule, which took effect on first inst., calls for the payment of $1.80 per thousand (net) by all classes—even the city forms no exception to the rule. The circular (a prettily arranged one) announcing the reduction concludes with the following statement: "It shall be our policy in the future to reduce the price of gas whenever we can do so with justice to our stockholders; and we wish to impress upon you the fact that the faster the consumption of gas increases in Warren the sooner can the price be again reduced." That is the way to place the situation before the notice of gas consumers, and we think the people of Warren are satisfied that Mr. Tayler means just what he says. Truly, the Ohio gas men are keeping well to the front.

CALERA (ALA.) TO HAVE GAS.—A gas works is to be built in Calera, the franchise having been granted to parties whose names are unknown to us. Calera is 63 miles north by east of Selma, and 33 miles south of Birmingham. Coal, limestone and clay deposits abound.

Cement from Blast Furnace Slag.

Engineering notes that three kinds of cement are made from blast furnace slag. The first, which is really more of a mortar than a cement, is produced by taking slag sand and grinding it with 15 per cent. of lime and 15 per cent. of oxide of iron. The grinding is generally done wet, and the product requires to be used within a few hours of being made, so that its employment is quite local. The second cement is made by grinding 75 per cent. of dry slag sand with 25 per cent. of dry slaked lime, according to Mr. Larsen's patent. It is essential that the ingredients should be reduced to a fine degree of pulverization, and that they should be intimately commingled; for this purpose the inventor uses a machine which he calls a "homogeneizer." The third cement is made according to a process brought out by Mr. Frederick Ransome. Equal weights of slag sand and chalk are ground together in a wet state, and after being dried are burned either in a kiln or revolving furnace, the process followed being similar to that used in making Portland cement. The following table gives analyses of two of the cements we have mentioned, and also of two examples of Portland cement:

Analyses of Cements.

	Lime.	Silica.	Alumina.	Ferric Oxide.	Ferrous Oxide.	Magnesia.	Water.
No. 1 cement.....	22.90	21.61	19.85	8.80	4.00	4.36	12.00
No. 2 (Larsen)....	41.96	24.34	18.74	.14	.27	6.57	4.70
Portland (No. 1)..	59.90	24.07	6.92	—	—	—	—
" (No. 2)..	55.57	22.92	8.00	—	—	—	—
Middlesbro' slag...	40.00	52.34		—	—	—	—
" (No. 2)	36.88	51.12		—	—	—	—
" (No. 3)	40.45	50.08		—	—	—	—

The first and second analyses are by Mr. J. E. Stead. The non-essential ingredients are not given.

From this it will be seen that the first two cements are widely different in their chemical constitution from Portland cement, and they are still more different in their physical condition, for the lime is mostly free, the materials not having undergone the incipient fusion which Portland cement experiences. Now, in the slag the proportion of lime to alumina and silica is about as 39:51, while in cement it is as 58:31. Therefore, 100 parts of slag, including the inert matters, requires the addition of 56 parts of lime, or of 100 parts of dry chalk or limestone, to provide the constituents of a good cement, and this is the mixture used in Ransome's process. The result gives a product which exceeds the strength of Portland cement, and which improves by age. Samples seven years old are in existence, and show no signs of deterioration. Of course, the process is only commercially feasible in districts where slag is produced, but there it offers a means of turning a useless product into a valuable material, and if it be carried out by Ransome's revolving furnace, the expense for plant is comparatively small.

The Market for Gas Securities.

The city gas share market suffered in common with other shares during the recent bear onslaught. Consolidated sold down to very low figures, but at time of writing (June 30) had recovered a good portion of the decline. It is to-day quoted at 80 bid, and is fairly strong. Other city shares are dull and strong. It is asserted that the principal manipulator of the recent Baltimore gas deal (presumably Mr. Garret) was dealt with by those who were supposed to be in the same boat with him much after the fashion that Jay Gould is said to have dealt with Cyrus W. Field, in the late Manhattan Railroad stock operation. At any rate, Baltimore Consolidated declined from 75 to 51 on large sales, but is now quoted at 57. It is a purchase at that figure, for the Baltimore rate war must soon be decided one way or the other. The Syracuse Company's new issue of stock was readily accepted by the original holders. We note a sale at auction of 6 shares Williamsburgh gas, at 130.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

July 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	80¼	80¾
Central	440,000	50	30	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	120	125
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	113
Mutual	3,500,000	100	102	105
" Bonds	1,500,000	1000	101	—
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	—	80
Richmond Co., S. I.	300,000	50	50	—
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	105	108
Citizens	1,200,000	20	58	—
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	143	145
" Bonds	300,000		—	106
Peoples	1,000,000	10	60	63
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	85	87
Nassau	1,000,000	25	105	—
" Ctfs	700,000	1000	100	—
Williamsburgh	1,000,000	50	128	130
" Bonds	1,000,000	—	111	—
Out of Town Gas Companies.				
Boston (Mass.) Gas Co.	2,500,000	500	193	200
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	140	145
" " Bonds	45,000	—	—	—
Chicago Gas Trust		100	61	63
Cincinnati G. & C. Co.	6,000,000	100	184	185
Consolidated, Balt.	6,000,000	100	57	—
" Bonds	3,600,000		107	107½
Chesapeake, Balt.	1,500,000	100	83	85
"	1,000,000		100	102
Consumers Toronto	1,000,000	50	192	—
Central, S. F., Cal.			86	100
Capital, Sacramento, Cal.			56	58
Hartford, Conn	750,000	25	140	142
Jersey City	750,000	20	168	—
Laclede, St. Louis, Mo.	2,000,000	100	125	—

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A competent man desires to take charge of a small gas works. Has had Twenty Years' experience in the line indicated. Is also a good, practical mechanic. Address,

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The advertiser, an English Gas Engineer, age 25, seeks an engagement

As Gas Works Manager or Assistant Manager.

Thoroughly understands the manufacture and distribution of gas, and is a good draughtsman and chemist. Address

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Engagement Desired,

By a young man of several years' experience in the manufacture and distribution of coal gas, either

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